

CLAIMS

What is claimed is:

1. An electrical machine comprising:
a rotor and shaft rotatable about a motor axis;
5 a core comprising magnetic material and having a first leg, a second leg, and a base portion, the first and second legs including first and second surfaces, respectively, the first surface including a first slot and the second surface including a second slot;
a coil disposed on the core; and
10 a bridge comprising magnetic material and inserted in the first and second slots.
2. The electrical machine of claim 1 wherein the first and second surfaces further include first and second recesses, respectively, and wherein the first and second
15 recesses include an arcuate shape.
3. The electrical machine of claim 2 wherein the first and second recesses are tapered.
- 20 4. The electrical machine of claim 1 wherein the core comprises a plurality of laminations having magnetic material.
5. The electrical machine of claim 1 wherein the magnetic material of the bridge includes isotropic steel.
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6. The electrical machine of claim 1 wherein the magnetic material of the bridge includes anisotropic steel.
7. The electrical machine of claim 1 wherein the bridge is disposed between the
30 rotor and the base portion of the core.

8. The electrical machine of claim 1 wherein the first surface further includes a third slot and the second surface further includes a fourth slot, and wherein the stator further includes a second bridge comprising magnetic material and inserted in the third and fourth slots.

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9. The electrical machine of claim 8 wherein the first bridge is disposed between the rotor and the base portion and the second bridge is not disposed between the rotor and the base portion.

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10. The electrical machine of claim 1 wherein the first leg, the second leg, and the base portion form a generally U-shaped core.

11. The electrical machine of claim 1 wherein the bridge comprises a sheet of magnetic material that includes an arcuate portion.

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12. The electrical machine of claim 1 wherein the bridge comprises first and second tabs and a central portion.

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13. The electrical machine of claim 12 wherein the central portion includes an arcuate surface.

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14. The electrical machine of claim 12 wherein the central portion has a length along the axis, the first and second tabs have a length along the axis, and the length of the center portion is less than the length of the first and second tabs.

15. The electrical machine of claim 12 wherein the tabs are disposed upwardly and outwardly with respect to the central portion.

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16. The electrical machine of claim 12 wherein the central portion is arcuate and the tabs are arcuate.

17. The electrical machine of claim 13 wherein the central portion includes a planar surface opposite the arcuate surface.

18. The electrical machine of claim 1 wherein the bridge includes a stack of laminations.

19. The electrical machine of claim 1 wherein the bridge includes a central portion and first and second tabs, the central portion including an arcuate surface disposed adjacent to the rotor and the first and second tabs being disposed in the first and second slots.

20. The electrical machine of claim 19 wherein the central portion has a first length with along the axis, the core has a second length with along the axis, and the first and second lengths are equal.

21. The electrical machine of claim 19 wherein the central portion has a first length with along the axis, the core has a second length with along the axis, and the first length is less than the second length.

22. The electrical machine of claim 1 wherein the first leg includes a third recess, wherein the electrical machine further comprises a housing having first and second endcaps, and wherein the first endcap includes a tab disposed in the third recess.

23. The electrical machine of claim 22 wherein at least one of the first and second endcaps include a recess adapted to receive a sensor.

24. The electrical machine of claim 1 and further including a housing coupled to the at least one bridge.

25. The electrical machine of claim 1 wherein the electrical machine includes an endcap, and wherein the endcap includes the bridge.

26. The electrical machine of claim 1 wherein the core includes anisotropic grain-oriented steel.

27. An electrical machine comprising:

a rotor and shaft rotatable about a motor axis;

a generally U-shaped stator core having a first leg, a second leg, and a base portion, the first and second legs including first and second surfaces, respectively, the first surface including a first recess, a first slot, and a second slot, and the second surface including a second recess, a third slot and a fourth slot, the first and second recesses being disposed adjacent to the rotor;

a first bridge comprising magnetic material and having a first central portion, a first tab and a second tab, the central portion including a first arcuate surface disposed adjacent to the rotor, and the first and second tabs being disposed in the first and third slots, respectively; and

a second bridge comprising magnetic material and having a second central portion, a third tab, and a fourth tab, the central portion including a second arcuate surface disposed adjacent to the rotor, and the third and fourth tabs being disposed in the second and fourth slots, respectively.

28. The electrical machine of claim 27 wherein the first bridge comprises a sheet of magnetic material.

29. The electrical machine of claim 28 wherein the pair of tabs are disposed upward and outward with respect to the central portion.

30. The electrical machine of claim 27 wherein the first bridge includes laminations.

31. The electrical machine of claim 27 wherein the first leg includes a third recess, wherein the electrical machine further comprises a housing having first and second endcaps, and wherein the first endcap includes a tab disposed in the third recess.

32. The electrical machine of claim 27 wherein the core includes anisotropic grain-oriented steel.

33. The electrical machine of claim 27 wherein at least one of the first and second endcaps include a recess adapted to receive a sensor.

34. An electrical machine comprising:

a rotor and shaft rotatable about a motor axis;

a generally U-shaped stator core comprising magnetic material and having a first leg, a second leg, and a base portion, the first leg including a first surface and a second surface opposite the first surface, the first surface including a first recess and a first slot and the second surface including a second recess, the second leg including a third surface and a fourth surface opposite the third surface, the third surface including a third recess and a second slot and the fourth surface including a fourth recess, the first and second recesses being disposed adjacent to the rotor;

a coil disposed on the core; and

first and second endcaps forming a housing for the rotor, at least one of the first and second endcaps including a first tab disposed in the first slot, at least one of the first and second endcaps including a second tab disposed in the second slot, at least one of the first and second endcaps including a third tab disposed in the second recess, and at least one of the first and second endcaps including a fourth tab disposed in the fourth recess.

35. A method of manufacturing a core for an electrical machine, the method comprising the acts of:

providing a planar sheet of magnetic material;

creating first and second generally U-shaped laminations from the planar sheet, the first and second generally U-shaped laminations resulting from a pattern formed in the planar sheet, the pattern including

the first generally U-shaped lamination having a first leg and a second leg, and

the second generally U-shaped lamination rotated one hundred-eighty degrees with respect to the first generally U-shaped lamination, the second generally U-shaped lamination including a third leg and a fourth leg, the third leg being disposed between the first and second legs; and

creating the core including stacking the first and second generally U-shaped lamination.

36. The method of claim 35 wherein the pattern further includes

a third generally U-shaped lamination disposed adjacent to the second generally U-shaped lamination, the third generally U-shaped lamination rotated one hundred-eighty degrees with respect to the second generally U-shaped lamination, the third generally U-shaped lamination including a fifth leg and a sixth leg, and

a fourth generally U-shaped shaped lamination rotated one hundred-eighty degrees with respect to the third generally U-shaped lamination, the fourth generally U-shaped lamination including a seventh leg and an eight leg, the seventh leg being disposed between the fifth and sixth legs.

37. The method of claim 35 wherein the first leg defines a width (L_S) and the second leg defines a width (L_S), wherein the first and second legs define a distance (L_G) between the first and second legs, and wherein the width (L_S) and the distance (L_G) satisfies the relationship ($L_S \leq L_G \leq 1.25 (L_S)$).

38. The method of claim 35 wherein the pattern includes a third generally U-shaped lamination rotated one hundred-eighty degrees with respect to the first generally U-shaped lamination, the third generally U-shaped lamination including a fifth leg and a sixth leg, and wherein the fifth leg is disposed adjacent to the third leg of the second generally U-shaped lamination and between the first and second legs of the first generally U-shaped lamination.

39. The method of claim 35 wherein the first leg defines a width (L_S) and the second leg defines a width (L_S), wherein the first and second legs define a distance (L_G) between the first and second legs, and wherein the width (L_S) and the distance (L_G) satisfies the relationship $(2 (L_S) \leq L_G \leq 2.5 (L_S))$.

40. The method of claim 35 wherein the creating act includes stamping the planar sheet with a die having the pattern.

41. The method of claim 35 wherein the planar sheet includes anisotropic grain-oriented steel.